Coronavirus will impact the atmospheric CO2 record – but not enough to slow global heating

Description

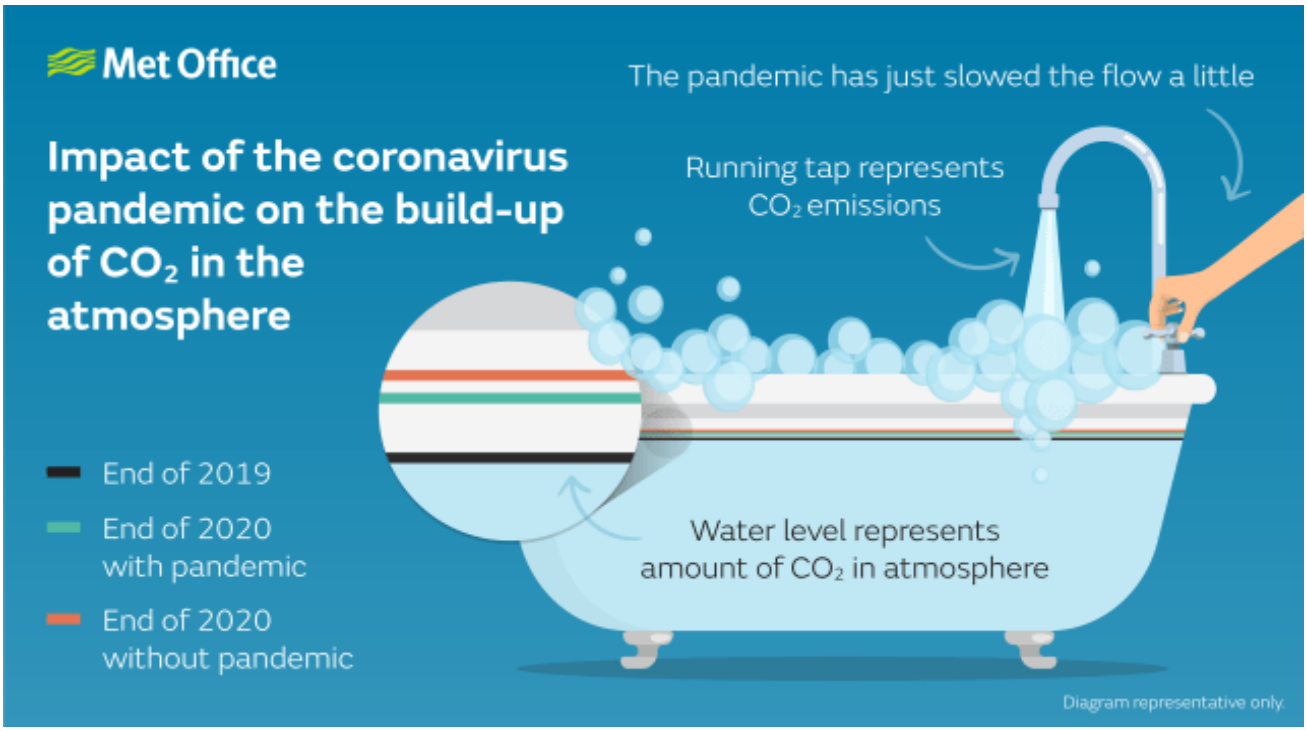
The drop in global carbon-dioxide emissions following the coronavirus pandemic could be large enough to noticeably slow the build-up of CO_2 in the atmosphere this year, a team of scientists at the Met Office and Scripps Institution for Oceanography have predicted.

But this will not be enough to slow the rise in global temperatures.

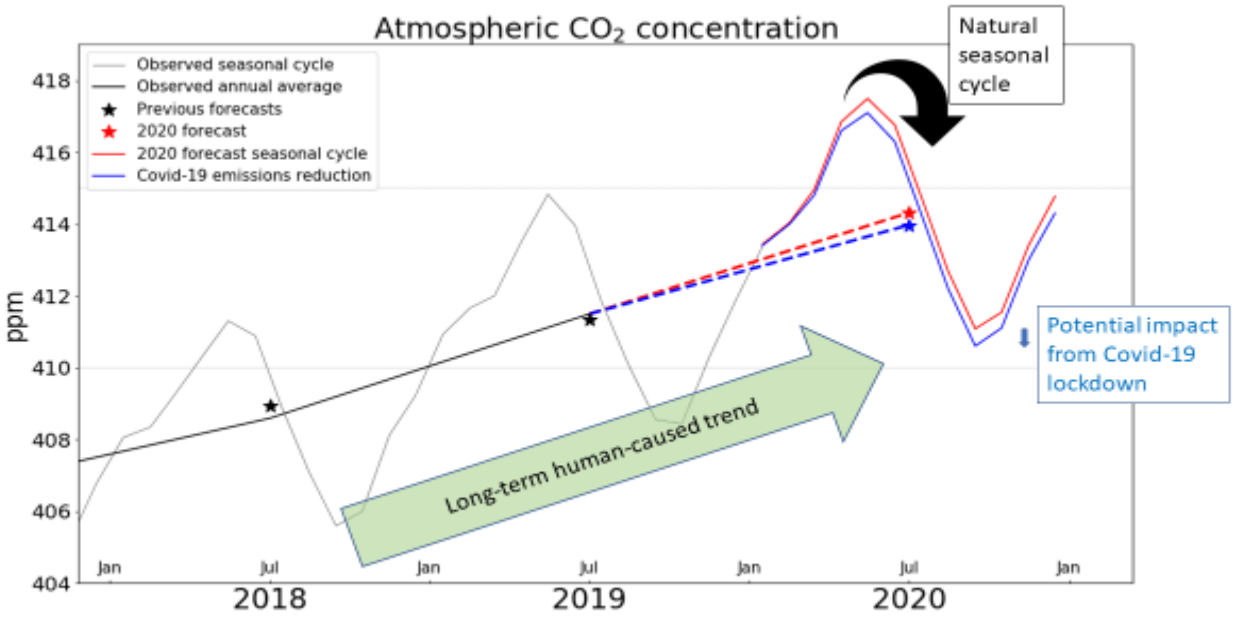
The Met Office has a successful track record of predicting the rise in CO_2 concentrations each year, as measured at the Mauna Loa Observatory in Hawaii by the Scripps Institution and NOAA. The CO_2 rise speeds up and slows down as natural carbon sinks – parts of the environment which can absorb carbon-dioxide – become temporarily weaker or stronger due to swings in the climate. 2020 was initially predicted to see a relatively fast rise due to weaker carbon sinks linked to the weather conditions in recent months, such as in the Australian bushfires. But the impact of weaker sinks now looks likely to be offset by reduced emissions from fossil burning this year.

The International Energy Agency (IEA) projects global fossil fuel emissions to decrease by 8% in 2020 due to the economic impact of the coronavirus pandemic. As a result, the Met Office and Scripps team predict the CO_2 rise measured at Mauna Loa to be 2.48 ± 0.57 parts per million (ppm), smaller than the 2.8 ppm rise predicted without the coronavirus impacts.

“Although emissions are reducing this year, this does not mean the build-up of CO_2 in the atmosphere will reverse – it will just be slightly slower” said Professor Richard Betts MBE, who leads the CO_2 forecast production for the Met Office. “An analogy is filling a bath from a tap – it’s like we are turning down the tap, but because we are not turning off the tap completely, the water level is still rising”.


Met Office
Impact of the coronavirus pandemic on the build-up of CO_2 in the atmosphere
The pandemic has just slowed the flow a little
Running tap represents CO_2 emissions
Water level represents amount of CO_2 in atmosphere
End of 2019
End of 2020 with pandemic
End of 2020 without pandemic
Diagram representative only.

If you think of the atmospheric concentration of carbon-dioxide like a bath, you can think of the flow of emissions like water flowing through a bath tap, which can be turned up or down.



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From

June onwards, CO_2 concentrations will fall – not because of reduced emissions, but due to uptake of carbon by plants in the northern hemisphere growing season. “Plants don’t grow equally all year” explains Professor Ralph Keeling, leader of the Scripps programme for monitoring CO_2 at Mauna Loa

and whose father David Keeling discovered the seasonal cycle in atmospheric CO_2. "The CO_2 goes down in the summer months and then back up", says Ralph.

After a minimum in September, now predicted to be 0.5 ppm lower than without the coronavirus impacts, the CO_2 will rise until the end of the year and onwards until next year's peak.

Crucially, the reduction in the CO_2 rise this year will not be enough to slow the ongoing rise in global temperatures. To halt the CO_2 rise and prevent further warming, CO_2 emissions would initially need to halve, and reduce by even more in the long term.

A more in-depth feature on this topic is being hosted by Carbon Brief.

Date Created
May 2020

Exceptional research and innovation continue to drive improvements in our science

Description

Now more than ever, it is clear that we are living in uncertain times, and we have all felt unsure of what the future will bring. At this time of great need, science has given us a beacon of hope, providing governments with the information it needs to take action and help society combat a global threat. Thanks to science, we can see a way to a day when the situation will be brighter again.

Professor Stephen Belcher Met Office chief scientist. Pic: Simon Hammett.

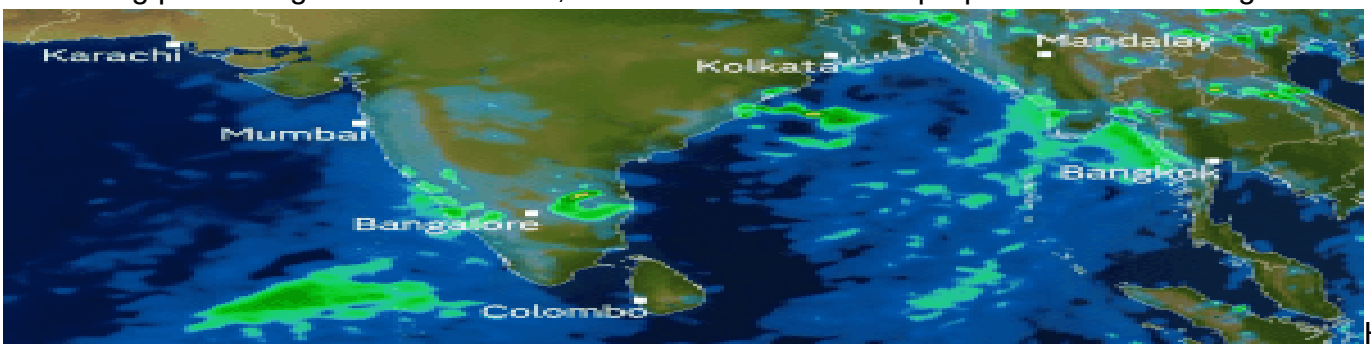
Against the backdrop of a pandemic is perhaps a poignant time to launch the Met Office's latest science strategy, priming us to provide the best support and advice to cope with the twin global threats of climate change and extreme weather events.

There are other changes in our world that we must also respond to. From technological innovation, to the need for clean growth, to the change in the climate itself. We need to ensure that our exceptional research and innovation continue to drive improvements in our science, technology and operations – and vice versa. As the Met Office Chief Scientist, it's important to me that the Met Office takes a key role in the development of weather and climate science and we can ensure we continue to deliver improvements in our services for our sponsors and the society, in our ever-changing world.

The supercomputer provides the backbone to the Met Office's scientific and forecasting capabilities. Pic: Simon Hammett.

I've been at the Met Office since 2012: formerly as Director of the Hadley Centre and more recently as Chief Scientist, overseeing a team of 500 scientists. I feel immensely proud of the work the Met Office has done to boost its science base even further, but this goes hand-in-hand with a huge feeling of responsibility. People's lives and livelihoods increasingly depend on avoiding the worst impacts of extreme weather events and climate change, and the Met Office has a responsibility to help people make the best decisions to stay safe and thrive. If anyone doubts the threats, the weather and climate records chart them perfectly. The period from 2015-2019 has seen the highest average global temperatures recorded since before the start of the industrial revolution. This isn't just happening at a global scale, as last year we saw records for the highest overall and winter temperature broken.

But we don't just passively monitor the records: We recently showed that the odds of us experiencing another heatwave like 2018 are thirty times greater now than they were in pre-industrial times. By continuing pioneering research like this, we will be better able to prepare for the challenges of our



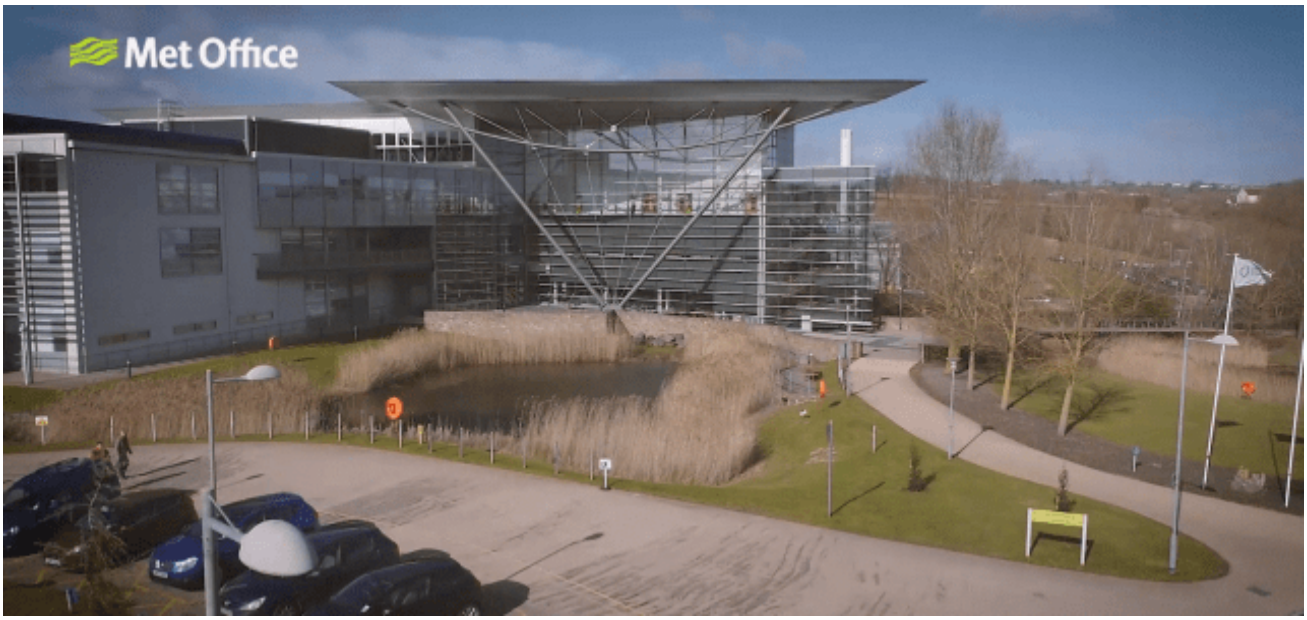
How

can we do this? In the past we've had a Science strategy, which gave direction to the Science programme. But now, the focus needs to shift to encompass the broader research and innovation activities across Science, Technology and Operations. In this way, we can better respond to the emerging needs of society and get the best value from our increased computing capacity. As our ability to better understand and predict future weather and climate continues to expand, so too do the expectations of our customers and stakeholders.

These evolving demands, together with the opportunities provided by new technology, such as the

announcement of a new high-performance computer, provide the drivers for this Research and Innovation Strategy.

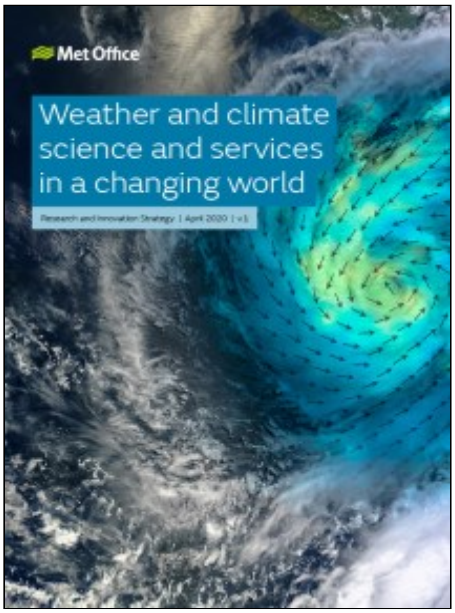
The strategy responds to these challenges and sets out the priorities needed to develop our exceptional science, technology and operations over the next 10 years. This gives us a pathway to take us through from fundamental science that will improve our weather observations, and models of weather and climate, right through to developing new tailored services that will really make a difference.



To discover more about the Met Office's Research and Innovation Strategy you can view a video from the following link: https://youtu.be/BcBUN0aMxSk

The R&I Strategy describes how we do research and innovation in three activities:

1. The reason we work at the Met Office, is that we drive our Science to Services.
2. Weather and climate is 'big science' that needs large-scale observations, software and IT. So, one of our responsibilities is to maintain and develop this National Capability.
3. Our changing world will require new services, which in turn will require new Pioneering Research.



The Met Office Research and Innovation strategy sets out the priorities needed to develop our exceptional science, technology and operations over the next 10 years for more information and to access the report visit: bit.ly/2WtTtCj

Under each of these three activities are three R&I themes, alongside which we have thee cross-cutting themes. You can explore the nine R&I themes and the three cross-cutting themes on our dedicated web pages. We have included some case studies to help bring these to life with real examples of the strategy in action.

In the first year we are going to particularly push three of these R&I themes as strategic actions, namely: exploiting the future of data sciences, delivering next-generation modelling capability and developing and nurturing capability partnerships.

This new strategy will ensure we continue the research and innovation that underpins all we do at the Met Office, and continue to be recognised as global leaders in weather, climate science and services in a changing world.

If we can deliver this strategy, we will have delivered better weather forecasts tailored to help decision making, a clearer view on what the world will look like in future climates, and a much better view of how we can transition to a resilient net zero economy.

Professor Stephen Belcher
Chief Scientist

Date Created
May 2020

Celebrating nature in a time of crisis

Description

As the world celebrates, today, the International Day for Biological Diversity, we turn our attention to the efforts to create a natural haven for wildlife and people at our Exeter headquarters.

The wildflower meadow is a key element of the Met Office's most precious wildlife habitats. Picture: Phillip Gill.

Grahame Madge is the chair of the Met Office Biodiversity working group – a group of wildlife enthusiasts from across the office who have been helping boost nature on site for the benefit of wildlife and staff since 2008. He said: "As the lives of people around the world have been transformed by the pandemic, many people have begun to pay more attention to nature. Whether it's being accompanied by the buzz of insects on a walk, or the snatches of birdsong that brighten a video conference call, nature is being noticed and appreciated, bringing the occasional smile or warm glow in otherwise challenging times.

“Although the decline in the abundance of some species across the UK is a crisis, we are never farfrom nature: it is all around us. Access to nature has proven benefits that can help people’s mental and physical health, but it also creates a responsibility: wildlife is part of our community and we have a duty of care to protect it.

“That’s very much the view of the Biodiversity Working Group which has strived to improve the fortunes of species around our site for over a decade, while creating opportunities for staff and visitors to connect with nature.”

The working group helps the Met Office improve the diversity of wildlife on its sites, especially at its Devon headquarters. Although compact, the site, on the outskirts of Exeter, contains some wildlife-rich areas, including: two ponds; numerous stands of trees and hedgerow; and a botanically-diverse area of grassland.

Bee-orchid is a priority species for Met Office conservation management.

One of the greatest successes has been the work to boost the population of bee-orchids, which have flourished on site and increased year on year so we now have over 300 individual bee orchid plants, thanks to sensitive management, including a specific grass-mowing regime.

The botanically-rich grassland includes several species of note, especially corky-fruited water dropwort and crested dogstail grass. Grahame Madge added: “In summer, the grassland is studded with the colours of meadow flowers, including knapweed, vetches and ox-eye daisies. The flowers provide nectar or pollen for a diversity of insects flitting from bloom to bloom, including marbled white butterflies, burnet moths and a variety of bumble-bees.

“The ponds attract a diversity of wetland wildlife, including reed warblers and newts. Occasionally, we’re visited by scarcer species, including a kingfisher and even an otter, which has spotted by one extremely lucky night-shift worker. However, although these highlights provide a talking point for staff,

we really manage the site for the regularly-visiting species like the two species of newt, and the selection of bat species which take gnats and other insects from above the ponds on warm summer evenings.

By working with neighbouring residents, the Met Office is hoping to provide a sustainable haven for hedgehogs. The hedgehog, which has dramatically declined over the last few decades in the UK, is one of 23 species for which we will try to take action.

“The tapestry of wildlife is continually changing as climate and local development exert an influence, and we carry out routine monitoring of the species on site to help monitor trends. Last year, we recorded small red-eyed damselfly for the first time. This species is spreading through the UK, after colonising from continental Europe, presumably boosted by climate change.

The Met Office site is increasingly fringed with housing and we can expect the balance of species on the site to change. Predation by cats may affect our population of slow-worms, for example, but building relationships with our neighbours may help boost the populations of other wildlife such as hedgehogs, song thrushes or pollinating insects. Grahame Madge added: “We have met with representatives from local housing developments and we’re keen to work with them to boost nature in our shared community. Hedgehogs and insects will disperse across the neighbourhood and won’t stop at our boundaries. So by working with our neighbours we can introduce complementary management to help those species living in the wider community.”

The working group has just helped the Met Office refine the list of species that occur on site and would benefit most from conservation assistance.

Kathy Gray is the Met Office's environmental advisor. She said: "Across the list of 24 species, or species groups, we have tried to include those which are declining nationally or are species special to our part of Devon.

"We take our wildlife and environmental responsibilities extremely seriously and we are proud of the fact that our efforts are nationally recognised. The Met Office was the first UK Government organisation to hold the Wildlife Trusts' Biodiversity Benchmark and we have been using our experience of wildlife management to work with Defra on the development of the Network for Nature initiative."

Peter Dorans is the Corporate Relations Manager for The Wildlife Trusts. He said: "Biodiversity Benchmark is a very demanding certification and provides assurance that the Met Office is managing its land to the very highest standards for wildlife. The Met Office has demonstrated that even in the grounds of a modern office in an urban location, wildlife can thrive.

"Our professional auditors have been particularly impressed by the efforts of the Biodiversity Working Group at the site to use all available areas for wildlife, such as converting amenity grassland to meadow, whilst still retaining a 'corporate' appearance. A great example of this is the project to display the Met Office logo in wildflowers. We believe that everyone should have the opportunity to experience the joy of wildlife every day and we know the site is highly valued by Met Office as a place for relaxing, enjoying nature and supporting wellbeing."

Date Created
May 2020

Three decades of Met Office Hadley Centre science, and counting..

Description

This week marks the 30th Anniversary of the opening of the Met Office Hadley Centre for Climate Prediction and Research by Prime Minister Margaret Thatcher on 25 May, 1990.

Professor Albert Klein Tank, director of the Met Office Hadley Centre, reflects on the first three decades of our history.

The Hadley Centre is a lasting legacy for the late Sir John Houghton (pictured above with Prime Minister Margaret Thatcher) who founded it with the aim of developing a centre of excellence in the UK for climate science. Sir John sadly passed away earlier this month.

In the last 30 years, climate science has advanced rapidly, and the Hadley Centre has been at the forefront of this development.

James Murphy, who has worked within the Hadley Centre since its opening, commented: “Margaret Thatcher’s original question was: can we predict the future changes in our climate, and potential

consequences? This has been answered, but our subsequent research has also exposed the complex challenges associated with projecting future changes with regional detail and understanding better the human contributions to past changes. Our answers are conditional upon our knowledge, which has evolved substantially during the past 30 years, and must continue to do so in the future."

Professor Klein Tank said: "When I joined as the new Director of the Hadley Centre two years ago, the increasing demand for climate services had already led to the changed name: Hadley Centre for Climate Science and Services, with services always based on the highest quality science. At this time, we started thinking hard about the next decades to ensure the Hadley Centre is ready for a changing future. An activity that resulted in the new Met Office Research and Innovation strategy and the related roadmap for climate science."

The first 30 years

The impacts of climate change are already evident both in the UK and worldwide, through rising temperatures, diminishing snow and ice, rising sea levels and changes in extreme weather events. The development of global observation datasets such as HadCRUT (Hadley Centre and Climatic Research Unit global mean surface temperature dataset) and advances in attribution science have allowed these changes in our climate system to be detected and the human influence on these changes to be quantified.

The subsequent generations of Met Office HadGEM family of climate models have helped understand the importance of processes related to aerosols and clouds, and carbon cycle feedbacks. These models also demonstrated that it is possible to make skilful and meaningful predictions of future climate on seasonal to decadal timescales to provide early warnings and on centennial timescales to inform adaptation and mitigation. I'm particularly proud of the unique use of a seamless modelling system, developed in the Met Office over the last 30 years, allowing us to test the physical basis of our climate models through verification of weather forecasts and seasonal predictions.

Contributions to the UN Climate Panel IPCC and UK assessment reports

The Hadley Centre has a tradition of making significant contributions to the Intergovernmental Panel on Climate Change (IPCC) process. Hadley Centre climate models, observational datasets and numerous peer-reviewed papers have been extensively assessed in all of the previous Assessment Reports and Special Reports and Hadley Centre scientists being authors and reviewers for these.

Hadley Centre scientist Richard Wood (back row, far right) at the Nobel Peace Prize ceremony in Oslo, 2007, jointly awarded to the IPCC/Al Gore for efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures need to counteract such change. Back row from left: John Houghton (WG1 Co-Chair for the I and III Assessment Reports), Robert Watson (IPCC former chair). Front row: Qin Dahe and Susan Solomon (WGI Co-Chairs for AR4); Dan Albritton.

The Hadley Centre has also previously hosted the so-called technical support units for Working Group I and II. The Hadley Centre is making a significant contribution to the IPCC for its 6th Assessment Report, which will be published from 2021/22. Hadley Centre research has also underpinned the first three UK Climate Change Risk Assessments (CCRA) that inform the National Adaptation Programme. The 3rd CCRA is currently underway, and the Technical Chapters of the main report are being written by a consortium of academics and consultants led by the University of Exeter and the Hadley Centre. We will continue making significant contributions to the IPCC process and the CCRA as we have done in the past.

Professor Klein Tank's review of Met Office Hadley Centre science concludes tomorrow with a look at the future of climate science.

Date Created
May 2020

Part II: Three decades of Met Office Hadley Centre science, and counting…

Description

In Part I of this two-part blog series (published yesterday) Professor Albert Klein Tank described the history and highlights of the Met Office Hadley Centre over the past 30 years. Here the Director of the Met Office Hadley Centre focuses on the future.

The next 30 years

In the next 30 years, the role of climate science at the Met Office Hadley Centre will evolve to one of quantifying the predicted changes in climate, and providing more detailed information on what these changes mean to individuals.

How can we help societies plan for the future and manage the risks from extreme climate events and avoid impacts which are too drastic to cope with?

The next 30 years are extremely important regarding the need for stronger mitigation by proceeding towards a transition to a net zero emissions economy. Climate science will play an important part in informing adaptation to the consequences of climate changes that are already unavoidable, whilst informing the mitigation actions aiming to avoid more severe impacts. The emphasis on action and solutions implies a shift from climate science to climate services. But, underpinning science aimed at understanding climate system processes remains crucial. Albert Klein Tank said: “I strongly believe that the climate services of the future rely on the pioneering and underpinning research of today.

“New frontiers of research including capability to robustly simulate and predict weather and climate extremes will bring additional utility to our forecasts and projections, both nationally and internationally.”

Following the 5th IPCC Assessment Report, the Paris Agreement in December 2015 marked a turning point in climate negotiations with 195 governments agreeing to take global action to tackle climate change and limit global temperature increase.

As a result of the Paris Agreement, the focus of climate research at the Met Office has changed to reflect these changing drivers:

- moving from proving that climate change is happening and predictable to monitoring, understanding and managing current and future weather and climate risks
- informing the development of strategies for lowering greenhouse gas emissions to avoid the most dangerous impacts of climate change and assessing the risk of abrupt, potentially irreversible, Earth system change (including so-called tipping points)

Preparing for inevitable climate changes will require more local information, an example of which is provided for the UK as part of the recently issued UK Climate Projections. Future projections require even more information on how global warming translates into local-scale changes in weather and climate extremes, such as windstorms, heat waves and coastal and inland flooding events.

The Met Office Hadley Centre is located in Exeter at the Met Office headquarters.

Importance of partnerships

Can the Met Office Hadley Centre do this on its own? The short answer is no. Building even stronger partnerships – both in the UK and internationally – will be essential to addressing the challenges we face in climate science and its applications. We will need to be able to deliver the science, given the increased complexity of observing and modelling the climate system. The Hadley Centre has a history of strong collaboration with: UK academics; partners sharing the same seamless modelling system; the World Climate Research Programme; and European partners. These will remain of high importance, despite the UK leaving the EU.

Climate Science Roadmap

The Roadmap for Hadley Centre research describes our specific contributions over the coming years. It details how we can deliver both the needs of customers, and the fundamental climate science questions to prepare for a changing future and help limit the impacts of climate change.

Albert Klein Tank added: “We do this by careful consideration of the changes in the demands for

climate science, awareness of the next big things in science and technology, and bridging of the gap between the core science and solutions." Quantifying, explaining, forecasting and projecting global and UK climate to inform early warnings, and adaptation-and-mitigation decision making will continue to be a key component. We will provide scientific evidence required to support the UK Government goals to reach NetZero by 2050.

For Met Office Hadley Centre scientist Ailsa Barrow – who was born on the opening day (25 May 1990) – the Roadmap gives direction to the priority areas she will be working on with colleagues across the global science community in the coming decades. Ailsa said: "I have witnessed first-hand, during my secondment to the Climate Evidence team in Defra, the recognition of Met Office Hadley Centre science in informing policy decisions of the UK Government.

"The breadth and versatility of our data helps users develop climate services as well as powerful tailored climate science communication.

"Now more than ever, in the lead up to COP26, the range of skills, experience and expertise across the Met Office Hadley Centre are required to equip policy makers, public, media and the academic communities with the evidence to make informed decisions to tackle one of the greatest challenges of our time."

Increasing the public's understanding of climate science through traditional media and social media will become an ever-more vitally important activity to maximise the reach of important findings revealed by the scientific research. Albert Klein Tank added: "I am convinced that maintaining our impartiality does not need to conflict with increased evidence-based support for action as our contributions to COP over the past years have demonstrated."

Professor Albert Klein Tank, Director of the Met Office Hadley Centre for Climate Science and Services.

The role of science in decision making

The current coronavirus pandemic has shown the importance of an evidence-based scientifically informed approach to inform society's response to challenges. If applied to dealing with climate change this would mean that governments accept early warnings and future projections from experts about the risks (despite uncertainty) and adopt adequate measures. The recent changes in ways of working for our scientists, enforced by the coronavirus, are giving us valuable experience (such as working from home and holding virtual meetings and conferences) that we will use in future as we aim to reduce the impact of our working lives on the planet.

No doubt that climate science will remain vitally important for the forthcoming challenges that we will face as a society over the coming thirty years and I am confident that the next 30 years will be as acclaimed for climate science in the Met Office Hadley Centre as the past 30 years has been.

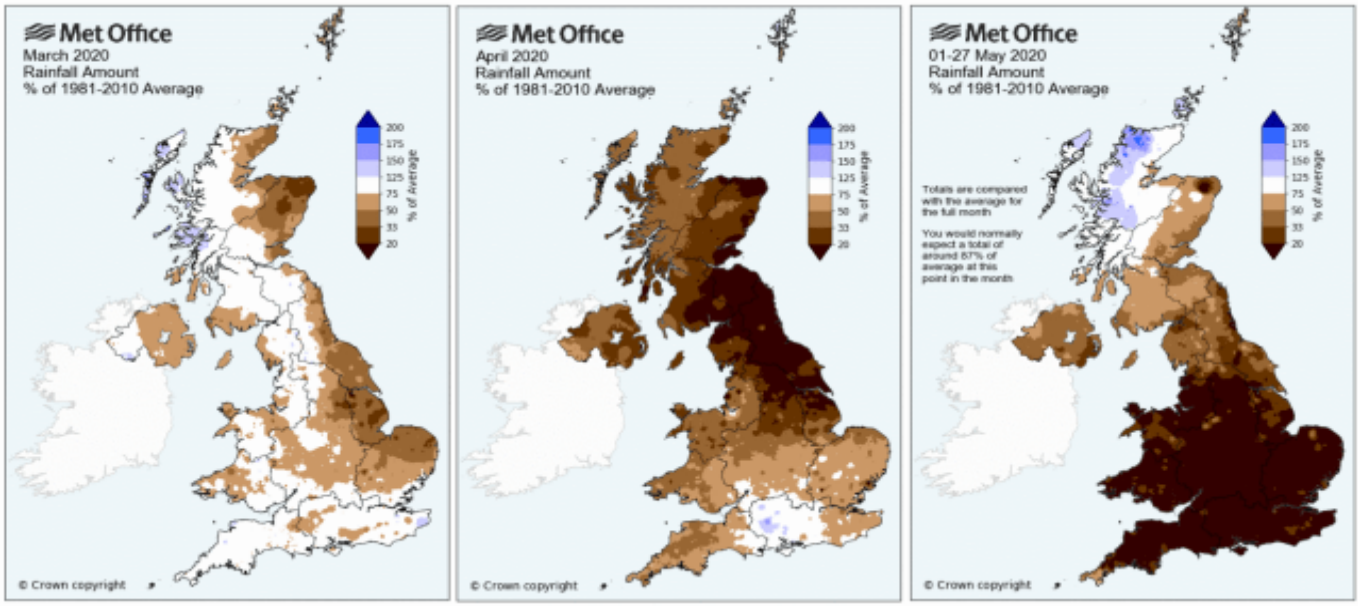
Date Created
May 2020

Spring 2020: the sunniest on record in the UK

Description

The UK has recorded the sunniest spring since records began in 1929. Since that time there have been only nine UK springs recording more than 500 hours of sunshine, with the previous sunniest being 555.3 hours in 1948.

However, up to 27 May, Spring 2020 has already recorded over 573 hours of sunshine; and with the forecast indicating an extension of the sunny conditions until the end of the month, Spring 2020 will surely cement its record even more firmly.



The weather patterns creating the sunny conditions have also created relatively dry ones too. Dr Mark McCarthy, from the Met Office's National Climate Information Centre, explains: "Much of spring has been dominated by successive areas of high pressure, leading to sunny and relatively dry conditions. In February, the Met Office was reporting record rainfall as Storms Ciara, Dennis and Jorge boosted totals, making February 2020 the wettest February on record.

"However, Spring 2020 has been very dry, and May in parts of England has been exceptionally dry. As it stands up to May 27, for England, May 2020 is the driest May on record since 1896, with less than 10mm rain falling across England on average."

Some locations have recorded far less rainfall than this. Northamptonshire – the driest county so far – for example has only recorded 1.5mm of rain during May. To put that measurement into context 1.5mm is less than the thickness of a 20-pence coin – you could lay the coin flat in the month's rainfall and the Queen's head would remain dry!

Although spring as a whole has been relatively dry, the patterns of each of the spring months have

been subtly different. Mark McCarthy explains: “The rainfall totals for each part of the UK for each month of spring (March, April and May) have followed different patterns. For example, parts of South West England had close to average rainfall in March, with drier conditions in April and very dry conditions in May. However, the pattern for other parts such as northern England was different with April being the driest month.”

The subtle differences in rainfall patterns across spring are largely influenced by the areas covered by the centre of the high pressure. Mark McCarthy explains: “You can perhaps see this effect most clearly in the May rainfall figures for north-west Scotland. During the month, the centre of the high pressure has been located to the south and east, leaving the Western Isles and other parts of north-west Scotland extending beyond the influence of the high pressure, leaving them exposed to weather fronts bringing more rainfall to the region, whereas southern England has been largely covered by the high pressure, suppressing rainfall.”

So far during May the Western Isles have received more than average rainfall (117%)

Until the month concludes some of the above may be liable to change. Full provisional climate statistics for May and Spring will be released on 1 June.

Date Created
May 2020